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Phænological Notes.

BY L. H. PAMMEL.

A paper read before the Iowa Academy of Science, December, 1891.

One of the points too often neglected in working up our flora is the relation that climate bears to plants. It is a question, too, that is of interest to horticulturists and agriculturists. Especially so when we take into consideration our cultivated plants. Few authors in working out our floras have touched upon this matter. Mr. Frederick Brendel[1] is one of the few who has given dates and time of ripening of seed of cultivated plants, as well as other phænological notes. Among the authors of our local floras who have given such data, I may mention W. R. Dudley,[2] Lester F. Ward,[2a] Britton,[3] Trelease,[4] Henry,[5] Halsted[6].

European investigators have been much more active in this direction. Extensive monographs and papers have been published by Fritsch,[7] Quetelet,[8] Lachmann,[9] Ihne,[10] Hoffmann,[11] etc.

This paper has been divided up into—

I. A succession of flowers for the years 1886 and 1891. The dates of the first appearance of flowers for 1886 are based on the observations of Halsted. In 1891 a large number of data were made by myself and P. H. Rolfs, but I have only selected some of them.

II. A comparison of the appearance of the flowers, leaves, etc., for the years 1886 and 1891. The observations of 1886 are based on those made by Richman under Halsted's[12] direction. Those of the spring of 1891 were made under my direction by Eugene Brown, a special student in botany.

III. Some notes on falling of leaves, especially as influenced by frost. Also a few notes on the effects that frost had on some plants—here again, not to make the paper too lengthy—a large number of observations are omitted. The observations were made on plants in a small garden, so that the conditions were nearly the same. These notes would be more valuable if exact temperatures had been recorded, as Fritsch has done. We hope to continue our observations next year, and keep a record of the temperature.

IV. Some notes on late flowering plants.

[1] Flora Peoriana; The Vegetation in the Climate of Middle Illinois; Illinois Agricultural Society, Vol. III.

[2] The Cayuga Flora.

[2a] Guide to the Flora of Washington and Vicinity.

[3] Bulletin Torrey Botanical Club, Vol. vi. p. 211–213; 235–237.

[4] First and Second Annual Report Wisconsin Agricultural Experiment Station, 1883, p. 56; 1884, p. 59.

[5] Annual Report of the Board of Regents of the University of Wisconsin for 1881.

[6] Bulletin Iowa Agricultural College, Department of Botany, 1886, p. 44.

[7] Thermische Constanten für die Blüthe und Fruchtreife von 889 Pflanzenarten, aus d. K. K. Akad. d. Wissenschaften, Vienna, 1861; Sitzung 28 November, pp. 120, 1 plate, Vienna, 1863.

[8] Sur le Climat de la Belgique, chap. iv.

[9] Die Entwickelung der Vegetation durch die Wärme u. s. w. Jahresb. (33 d. schlesischen Gesellsch. f. vaterländische Cultur in Breslau (1855).

[10] Beiträge zur Phänologie. Giessen, 1884, 178 pp. (Hoffmann and Ihne), Pt. I, E. Ihne; Pt. II, H. Hoffmann.

[11] Ueber den phænologischen Werth von Blattfall und Blattverfärbung, Allg. Forst u. Jagdzeitung, 1888, No. 8; April, 1889, etc.

[12] Bulletin Iowa Agricultural College, 1886, p. 44.

I.—SUCCESSION OF FLOWERS FOR 1886 AND 1891.

NAME.	1886.	1891.
Acer nigrum	April 30.	......
Acer saccharinum	March 22,	April 7.
Amelanchier Canadensis	April 20,	“ 26.
Anemone nemorosa	“ 20,	“ 26.
Antennaria plantaginifolia	“ 18,	“ 26.
Capsella Bursa-pastoris	“ 15,	“ 24.
Claytonia Virginica	......	“ 19.
Dentaria laciniata	April 20,	“ 26.
Dicentra Cucullaria	“ 15,	“ 20.
Draba Caroliniana	“ 20,	“ 23.
Erythronium albidum	“ 15,	“ 28.
Geranium maculatum	May 4,	May 22.
Hepatica acutiloba	April 9,	April 12.
Hydrophyllum Virginicum	May 16,	May 14.
Hypoxis erecta	April 25,	“ 14.
Lithospermum canescens	May 1,	“ 12.
Mertensia Virginica	April 20,	April 28.
Negundo aceroides	“ 16,	“ 23.
Oxalis corniculata	......	May 23.
Oxalis violacea	April 23,	“ 15,
Pastinaca sativa	May 29,	“ 22.
Phlox pilosa	......	“ 22.
Podophyllum peltatum	May 7,	“ 22.
Populus monilifera	April 18,	April 20.
Prunus Pennsylvanica	May 10,	“ 30.
Pyrus coronaria	“ 4,	May 13.
Ribes aureum	......	April 28.
Ulmus Americana	April 13,	“ 24.
Ulmus fulva	“ 23,	“ 24.
Viola palmata, var. cucullata	“ 18,	“ 29.
Viola pubescens	......	“ 25.

II.—Calendar of Trees and Shrubs, Ames, Iowa, 1886.

NAME.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	SEPTEMBER.	OCTOBER.	NOVEMBER.
Hard Maple (Acer nigrum.)	....	20 L. B. opening.	3 L. 1½ in. long 16 Full leaf.	4 Terminal B formed.	....	2 L. turning. 18 L. falling.	....	....
Soft Maple (Acer saccharinum.)	22 In flower.	12 L. B. opening.	16 Full leaf. Fruit falling.	27 Terminal B. formed.	....	....	4 L. turning. 14 L. falling.	....
Hackberry (Celtis occidentalis.)	....	20 B. swelling.	23 Full leaf.	....	12 Terminal B. formed.	....	8 L. falling.	....
Honey Locust (Gleditschia triacanthos.)	....	14 B. swelling.	3 L. ⅔ in. long. 17 In flower.	....	....	....	1 Seeds ripe. 9 L. falling.	....
Butternut (Juglans cinerea.)	....	29 L. B. open.	4 Full leaf.	....	....	....	....	....
Cottonwood (Populus monilifera.)	....	12 B. swelling. 20 In flower.	16 Full leaf.	29 Terminal B. formed.	....	....	4 L. turning. 12 L. falling.	....
Wild Crab (Pyrus Iowensis.)	....	14 B. swelling.	....	4 Full leaf.	....	....	....	....
Ash Leaved Maple (Negundo aceroides.)	....	12 B. swelling. L. 2 in. long.	21 In full leaf.	28 Terminal B. formed.	....	23 Fruit ripe.	2 L. frost-bitten. 5 L. falling.	....
Lilac (yringa vulgaris.)	19 B. swelling.	12 B. opening. 26 L. 1 in. long.	3 In flower.	29 Terminal B. formed.	....	....	....	3 L. falling.
White Elm (Ulmus Americana.)	....	12 In flower. 20 L. B. swelling.	3 L. 2 in. long. 21 Full leaf.	11 Terminal B. formed.	....	....	2 L, frost-bitten. 12 L. falling.	....

II.—Calendar of Trees and Shrubs, Ames, Iowa, 1891.

NAME.	APRIL.	MAY.	JUNE.	JULY.	SEPT.	OCTOBER.	NOVEMBER.	REMARKS.
Hard Maple................ (Acer nigrum.)	24 L. B. swelling.	3 L. 1½-2½ in. long. 28 L. 6-10 in. long, incl. petioles.	......	......	....	18 L. becoming yellow. 27 Nearly all off.	....	Leaves fall much earlier and rapidly than soft maple. Tints brilliant. Some variations in falling of leaves.
Soft Maple................. (Acer saccharinum.)	11 In flower. 14 B. swelling.	9 L. 1¼-2¾ in. long. 24 Fruit falling.	......	......	....	17 L. green. 30 L. dry and falling.	1 L. falling rapidly.	Brilliant tints on some trees, not as pronounced as hard maple. Great variations in falling of leaves of trees growing in close proximity.
Hackberry................. (Celtis occidentalis)	13 B. no change. 24 B. swelling.	9 L. ¾-1½ in. long. 16 L. 2-3 in. long.	......	......	....	11 L. not frost-bitten, some green, some yellow. 24 L. off or nearly so.	....	Leaves of some trees commence to change their color early, but they seem to hang on well.
Honey Locust.............. (Gleditschia triacanthos.)	13 B. no change. 18 B. swelling. 20 B. opening.	16 New wood, 2-4 in. long. L. 2-3½ in. long.	......	......	....	18 L. falling.	....	
Coffee Tree................ (Gymnocladus Canadensis.)	13 B. no change. 14 B. swelling. 29 B. opening.	9 L. 1½-2 in. long. 16 L. 3-10 in. long.	......	......	....	10 L. falling, some green. Some trees nearly all off. 24 L. all off.	....	
Butternut................... (Juglans cinerea.)	15 B. swelling.	9 L. ¾-1½ in. long. 16 In flower. 28 L. 8-12 in. long. Catkins falling.	......	......	28 Nuts falling.	10 L. nearly all off.	....	Leaves badly affected with a fungus (*Marsonia Juglandis*).

Sycamore.................. (Platanus occidentalis.)	13 B. no change. 29 B. swelling.	9 L. 1-1½ in. long. 16 L. 1-2½ in. long.	......	......	....	....	....
Cottonwood............... (Populus monilifera.)	13 B. ½-¾ in. long.	16 Seeds falling.	......	......	....	....	....
Wild Crab .... (Pyrus coronaria.)	7 B. no change. 14 B. ⅛-¼ in. long.	9 L. ¾-1½ in. long. 13 L. 1-2⅜ in. long. In flower. 23 Petals falling.	......	......	....	....	....
Burr Oak .... (Quercus macrocarpa.)	13 B. no change. 24 B. ¼-½ in. long. L. 1-1¼ in. long.	9 L. 2-2¾ in. long. In flower. 16 L. 3-5 in. long.	......	......	....	10 L. green. 14 L. some red, tinged with yellow. 27 L. all yellow, falling rapidly.	....
Ash Leaved Maple......... (Negundo aceroides.)	1 B. no change. 24 B. slightly swollen. In flower. 29 Flowers falling. L. ½-1 in. long. Fruit ⅛-¼ in. long.	9 L. 1¾-2 in. long. Fruit ½ in. long. 28 L. 2-4 in. long. Fruit 1¼ in. long.	......	......	....	24 L. all off, or nearly so.	....
Lilac...................... (Syringa vulgaris.)	1 B. no change. 7 B. no change. 18 B. ¼-½ in. long. 29 L. ½-1¼ in. long.	9 L. ¾-2¼ in. long. In flower. 16 In full bloom. 23 L. 2-3¼ in. long. Out of flower.	......	......	....	14 L. green.	1 L. yellowish green, falling.
White Elm................ (Ulmus Americana.)	11 B. swelling. 18 In flower.	28 L. 4 5 in. long. Fruit falling.	......	.....:	....	13 L. yellow, falling.	....

III.—FROST AND BEHAVIOR OF PLANTS.

Portulaca oleracea. Early in September tips slightly affected by frost; Oct. 1st, frost nearly destroyed it; 9th, in an open field, black; 18th, started to grow again.

Amarantus blitoides. Early in September slightly affected by frost; Oct. 7th, frost nearly destroyed it; 9th, black; 18th, no attempt at growth, as in the case of *Portulaca.*

A. albus. Oct. 11th, destroyed by frost.

Apios tuberosa. Oct. 11th, completely killed by frost in low ground.

Panicum sanguinale. Oct. 8th, more or less destroyed by frost.

Panicum capillare. Oct. 8th, more or less destroyed by frost.

Zea Mays. Oct. 7th, young plants completely frozen; 16th, old plants have been dry for several days.

Sorghum vulgare. Oct. 7th, more or less affected.

Cucurbita Pepo and *C. maxima.* Early in September tips slightly frosted; Oct. 9th, plants black.

Lycopersicum esculentum. Early in September tips slightly affected by frost; Oct. 4th, killed by frost; 9th, plants black.

Borrago officinalis. Oct. 22d, a few leaves affected; 23d, many leaves frozen.

Asclepias Syriaca. Oct. 7th, not affected by frost; 11th, slightly frosted in low places; 24th, completely frozen.

Euphorbia heterophylla. Oct. 7th, slightly frosted; 19th, nearly all leaves frosted.

Vitis riparia. Oct. 8th, slightly frosted.

Vitis—Concord grape. Not affected early in September; Oct. 14th, somewhat frost-bitten, some leaves brown; 21st, leaves much frosted; 22d, all frosted, falling rapidly.

Callirhoe pedata. Oct. 7th, not affected by frost; 16th, seriously affected.

Scabiosa atropurpurea. Oct. 7th, no injury whatever; 23d, no injury; Nov. 11th, no injury; 21st, some injury to leaves.

Adonis autumnalis. Oct. 2d, no injury to leaves; 10th, no injury; Nov. 2, no injury to leaves whatever; 21st, no injury to leaves.

Centaurea Cyanus. Oct. 7th, no injury to foliage; 17th, not affected; 18th, heavy frost, not injured; 22d, still green; Nov.

11th, injured seriously; 21st, old plants killed, young seedlings not.

Verbena Aubletia Oct. 7th, no injury; 21st, no injury; Nov. 11th, no injury except to the young shoots.

Leonurus Cardiaca. Oct. 7th, no injury; 23d, no injury; Nov. 21st, young plants not injured.

Lepachys pinnata. Oct. 9th, no injury; 23d, no injury.

Helianthus annuus. Oct. 7th, no injury; 19th, some injury.

Aster multiflorus. Oct. 10th, no injury; 22d, no injury.

Solidago rigida. Oct. 8th, no injury; 10th, no injury; 23d, no injury; Nov. 21st, some leaves injured.

Ligustrum vulgare. Oct. 7th, no injury; Nov. 21, leaves apparently uninjured, reddish green.

Amygdalus Persica. Oct. 19th, no injury, leaves green; heavy frost on 18th; 21st, no injury; Nov. 15th, leaves on young tree green; snow and heavy frost on 14th.

Phlox Drumondii. Oct. 25, no injury; Nov. 1, no injury.

Populus alba. Oct. 11th, no injury, leaves green; 30th, leaves on top branches yellow, the others yellowish green, no injury; Nov. 11th, some leaves black, ice formed during night; 15th, leaves all black.

IV.—Late Flowering Plants.

Scabiosa atropurpurea. In flower Nov. 11th; blooms till killed by frost.

Centaurea Cyanus. In flower Nov. 2d; does not cease flowering till it is completely killed.

Adonis autumnalis. Nov. 21st, flowers came out after a very hard frost.

Gilia capitata. Nov. 2d, in flower; first hard frost affected flowering somewhat.

Lepachys pinnata. Oct. 23d, in flower; first hard frost affected flowering; plants grew near a building, otherwise flowering had ceased about three weeks sooner.

Saponaria officinalis. Oct. 8th, in flower in an open garden.

Solidago rigida. Oct. 23d in flower; only one plant in garden was observed; all others ceased to flower some time ago.

Reseda odorata. Oct. 21st, still in flower, not abundant; frost checked flowering.

Callirhoe pedata. A few plants in flower Nov. 2d.

Phlox Drummondii. In flower Nov. 1st, only sparsely.

Pilea pumila In flower Oct. 8th.

Phleum pratense. In flower Oct. 12th.

Gaura Lindheimerii. In flower Oct. 22d.

Oxalis corniculata. In flower Oct. 22d; plants revived after a frost early in October.

Botanical Notes.

The Compilation of the Systematic and Alphabetic Index of New Species of North American Phanerogams and Pteridophytes, published in 1892, is now in preparation at the United States National Herbarium. The index will be more nearly complete and published at an earlier date if all botanists will promptly send to Dr. Vasey, Chief of the Botanical Division, their recent monographs and reprints of articles in botanical works.

Plantæ Schlechterianæ. The undersigned has been fortunate enough to induce a German gardener, Herr Schlecter, established in the Cape Colony, to participate in the publishing of botanical collections from South Africa, and to make an agreement with him concerning the enterprise.

The several centuries are to be distributed at regular intervals; the disposition of the material is left to the choice of the undersigned in concert with various monographers. The first six hundred or even one thousand numbers are destined to be distributed in the course of this year, and have their origin in the sonthern corner of the colony; they are well prepared and perfectly dried.

In accordance with my advice Schlechter has now gone to the northeastern districts of the colony, intending to follow up his explorations in the Transvaal, etc., during the next year. Provided the sale of the first centuries, destined to be given out before the end of the year, be regular and ascertained, the separate price for those of this as well as of next year, will be thirty-